14.(amended) The balloon catheter as claimed in claims 8, 10 or 11[, 11, or 12] wherein the pocket is sealed by a membrane.

15.(amended) The balloon catheter as claimed in claims 8, 9, 10 or 11[, 11, or 12] wherein the pocket is sealed by the balloon membrane.

Add new claims 20-30 as follows:

20. A method for operating an intra-aortic balloon system comprising a balloon catheter comprising a balloon membrane, a fiberoptic fiber and a fiberoptic sensor connected to said fiberoptic sensor, said method comprising measuring a patient's blood pressure waveform via the fiber optic sensor, and using the waveform to time the inflation and deflation of the balloon membrane.

21.The method as claimed in claim 20 further comprising the step of detecting a dicrotic notch in the measured patient's blood pressure waveform and using the dicrotic notch to time the inflation and deflation of the balloon membrane.

22. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip, the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket.

23. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
the pocket extends from the outer surface of the tip to a point between the inner surface of the tip and the outer surface of the tip.

24. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
the outer surface of the tip comprises a distal sloping portion and wherein the pocket extends from said distal sloping portion to a point between said distal sloping portion and said proximal end of said tip.

25. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,

the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is filled with a protective material.

26. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is filled with a gel.

27. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is sealed by a membrane.

28. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a

the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,

the pocket extends from a point between the inner surface of the tip and the outer surface of the tip to the inner surface of the tip such that it communicates with the inner lumen.

fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is sealed by the balloon membrane.

29. The method as claimed in claim 20 wherein the balloon catheter comprises an outer tube, an inner tube disposed within an outer surface of the outer tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, a proximal end of the balloon membrane is connected to a distal end of the outer tube and a distal end of the balloon membrane is connected to the tip, an inner surface of the outer tube defines an outer lumen,
the fiberoptic fiber has a balloon portion which is disposed with the balloon membrane and an outer tube portion which is disposed within the outer tube, the balloon portion of the fiberoptic fiber is connected to the inner tube, the outer tube portion of the fiberoptic fiber is disposed within the outer lumen.

30. The method as claimed in claim 20 wherein the balloon catheter comprises an outer tube, an inner tube disposed within an outer surface of the outer tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, a proximal end of the balloon membrane is connected to a distal end of the outer tube and a distal end of the balloon membrane is connected to the tip, an inner surface of the outer tube defines an outer lumen, an inner surface of the inner tube defines an inner lumen,

Below please find a clean copy of all of the pending claims with all amendments incorporated:

1. A balloon catheter comprising a balloon membrane, a tip, a fiberoptic sensor connected to said tip, a fiberoptic fiber, an outer tube, and an inner tube disposed within an outer surface of said outer tube, said inner tube extending beyond a distal end of the outer tube, a distal end of the balloon membrane being connected to the tip and to a distal end of the inner tube, said fiberoptic fiber being connected on a distal end to the fiberoptic sensor and proximal to the fiberoptic sensor being at least partially connected along its length to the inner tube.

2. The balloon catheter as claimed in claim 1 wherein the fiberoptic fiber is sandwiched between the inner tube and a thin walled tube disposed over the inner tube.

3. The balloon catheter as claimed in claim 2 wherein the thin walled tube is heat shrunk over the fiberoptic fiber and inner tube.

4. The balloon catheter as claimed in claim 1 wherein the fiberoptic fiber is embedded in the inner tube.

5. The balloon catheter as claimed in claim 1 wherein the fiberoptic fiber is adhered to an outer surface of the inner tube.

6. The balloon catheter as claimed in claim 1 wherein the inner tube is connected to the outer tube, an inner surface of the outer tube defines an outer lumen, and the fiberoptic fiber has a balloon portion which is disposed within the balloon membrane and an outer tube portion which is disposed within the outer tube, the balloon portion of the fiberoptic fiber is connected to the inner tube, the outer tube portion of the fiberoptic fiber is disposed within the outer lumen.

7. The balloon catheter as claimed in claims 1 or 6 wherein

the inner tube is connected to the outer tube and comprises two tubes connected end-to-end.

8. The balloon catheter as claimed in claim 1 wherein the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, and wherein the fiberoptic sensor has a pressure sensing surface, the fiberoptic sensor is embedded in the tip such that the pressure sensing surface is exposed to said pocket.

9. The balloon catheter as claimed in claim 8 wherein the pocket extends from the outer surface of the tip to a point between the inner surface of the tip and the outer surface of the tip.

10. The balloon catheter as claimed in claim 8 wherein the outer surface of the tip comprises a distal sloping portion and wherein the pocket extends from said distal sloping portion to a point between said distal sloping portion and said proximal end of said tip.

11. The balloon catheter as claimed in claim 8 wherein the pocket extends from a point between the inner surface of the tip and the outer surface of the tip to the inner surface of the tip such that it communicates with the inner lumen.

12. The balloon catheter as claimed in claims 8, 9, 10, or 11 wherein the pocket is filled with a protective material.

13. The balloon catheter as claimed in claims 8, 9, 10, or 11 wherein the pocket is filled with a gel.

14. The balloon catheter as claimed in claims 8, 9, 10, or 11 wherein the pocket is sealed by a membrane.

15. The balloon catheter as claimed in claims 8, 9, 10, or 11 wherein the pocket is sealed by the balloon membrane.

16. A balloon catheter system comprising a fiberoptic sensor catheter and a balloon catheter, said balloon catheter comprising a balloon membrane, a tip having a tip lumen, an outer tube, and an inner tube disposed within an outer surface of said outer tube, said inner tube extending beyond a distal end of the outer tube, a distal end of the balloon

membrane being connected to the tip and to a distal end of the inner tube, said fiberoptic sensor catheter comprising a tube having a fiberoptic sensor connected to a distal end, said fiberoptic sensor being connected to a distal end of a fiberoptic fiber which is connected to the tube, said fiberoptic sensor catheter fitting within the inner tube and in the tip lumen.

17.The balloon catheter as claimed in claim 16 wherein the inner tube is connected to the outer tube.

18.An intra-aortic balloon catheter comprising a co-lumen tube, a balloon membrane, an inner lumen extension tube, and a tip, said co-lumen tube having an outer lumen inner surface, defining an outer lumen, and an inner lumen inner surface, defining an inner lumen, said inner lumen having a smaller cross sectional area than said outer lumen, a proximal end of the inner lumen extension tube and a proximal end of the balloon membrane are connected to a distal end of the co-lumen tube, the tip, a distal end of the inner lumen extension tube, and a distal end of the balloon membrane are connected, said tip having an outer surface, an inner surface, defining an inner tip lumen, and a pocket, a fiberoptic sensor is embedded in the tip such that a pressure sensing surface of the fiberoptic sensor is exposed to said pocket.

19.The intra-aortic balloon catheter as claimed in claim 18 wherein the pocket is filled with a protective material and wherein the pocket is sealed by a membrane.

20. A method for operating an intra-aortic balloon system comprising a balloon catheter comprising a balloon membrane, a fiberoptic fiber and a fiberoptic sensor connected to said fiberoptic sensor, said method comprising measuring a patient's blood pressure waveform via the fiber optic sensor, and using the waveform to time the inflation and deflation of the balloon membrane.

21.The method as claimed in claim 20 further comprising the step of detecting a dicrotic notch in the measured patient's blood pressure waveform and using the dicrotic notch to time the inflation and deflation of the balloon membrane.

22. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip, the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket.

23. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip, the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
the pocket extends from the outer surface of the tip to a point between the inner surface of the tip and the outer surface of the tip.

24. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip, the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending

from a proximal end of the tip to a distal end of the tip, the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
the outer surface of the tip comprises a distal sloping portion and wherein the pocket extends from said distal sloping portion to a point between said distal sloping portion and said proximal end of said tip.

25. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is filled with a protective material.

26. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is filled with a gel.

27. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon

membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is sealed by a membrane.

28. The method as claimed in claim 20 wherein the balloon catheter comprises a tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, the balloon membrane is connected on a proximal end to the distal end of the tube and is connected on a distal end to the tip,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
wherein the pocket is sealed by the balloon membrane.

29. The method as claimed in claim 20 wherein the balloon catheter comprises an outer tube, an inner tube disposed within an outer surface of the outer tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, a proximal end of the balloon membrane is connected to a distal end of the outer tube and a distal end of the balloon membrane is connected to the tip, an inner surface of the outer tube defines an outer lumen,
the fiberoptic fiber has a balloon portion which is disposed with the balloon membrane and an outer tube portion which is disposed within the outer tube, the balloon portion of the fiberoptic fiber is connected to the inner tube, the outer tube portion of the fiberoptic fiber is disposed within the outer lumen.

30. The method as claimed in claim 20 wherein the balloon catheter comprises an outer tube, an inner tube disposed within an outer surface of the outer tube, a balloon membrane, a tip, a fiberoptic sensor and a fiberoptic fiber, a proximal end of the balloon membrane is connected to a distal end of the outer tube and a distal end of the balloon membrane is connected to the tip, an inner surface of the outer tube defines an outer lumen, an inner surface of the inner tube defines an inner lumen,
the tip comprises an inner surface, an outer surface, and a pocket, said inner surface defining a tip lumen extending from a proximal end of the tip to a distal end of the tip,
the fiberoptic sensor has a pressure sensing surface and is embedded in the tip such that the pressure sensing surface is exposed to said pocket,
the pocket extends from a point between the inner surface of the tip and the outer surface of the tip to the inner surface of the tip such that it communicates with the inner lumen.